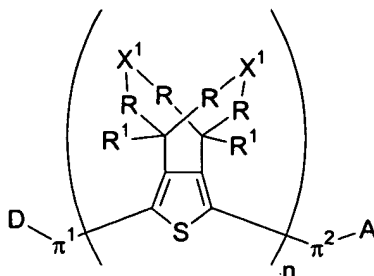


CLAIMS

What is claimed is:

1. A chromophore of the structure



wherein, independently at each occurrence,

D is an electron donating group having low electron affinity relative to the electron affinity of A;

π^1 is absent or a bridge that provides electronic conjugation between D and the thiophene ring;

π^2 is absent or a bridge that provides electronic conjugation between A and the thiophene ring;

A is an electron accepting group having high electron affinity relative to the electron affinity of D;

X^1 is an alkyl linker, an aryl linker, a heteroalkyl linker, or nothing;

R is alkyl, aryl, heteroalkyl or heteroaryl;

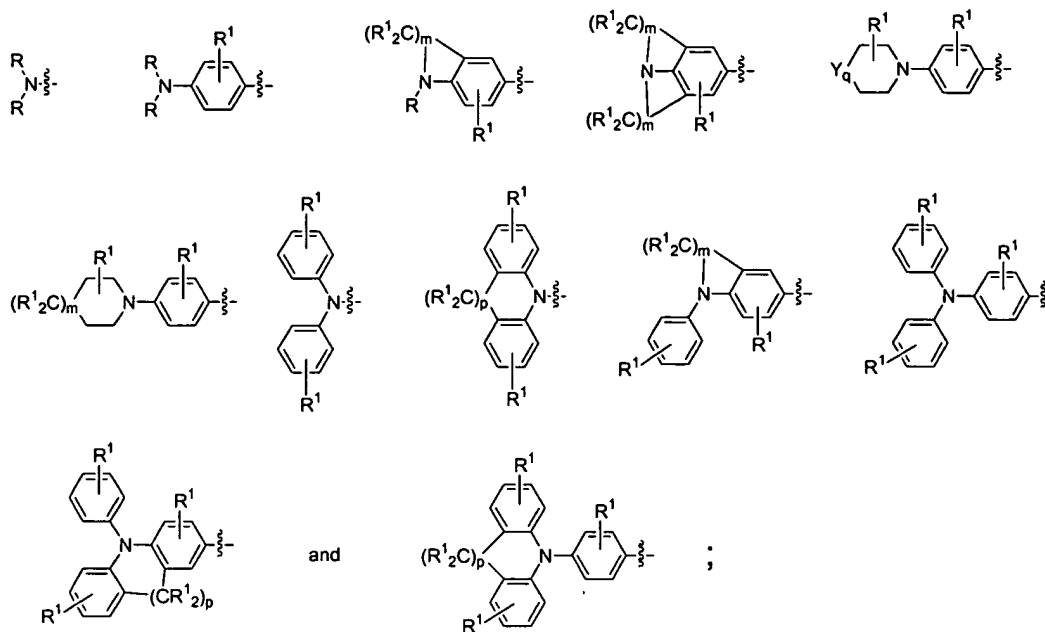
R^1 is alkyl, aryl, or heteroalkyl when X^1 = nothing with the additional proviso that

R^1 can be hydrogen if X^1 = an alkyl, aryl, or heteroalkyl linker;

$n = 1-4$; and

any one of π^1 , π^2 , D, or A can be further independently substituted with one or more halogen, alkyl, aryl, or heteroalkyl.

2. The chromophore of claim 1 wherein D is selected from the group consisting of



wherein, independently at each occurrence,

R of D is alkyl, aryl or heteroalkyl;

R¹ of D is hydrogen, alkyl, aryl or heteroalkyl;

Y is O, S or Se;

m is 2, 3 or 4; p is 0, 1 or 2; and q is 0 or 1.

3. The chromophore of claim 2 wherein, independently at each occurrence,

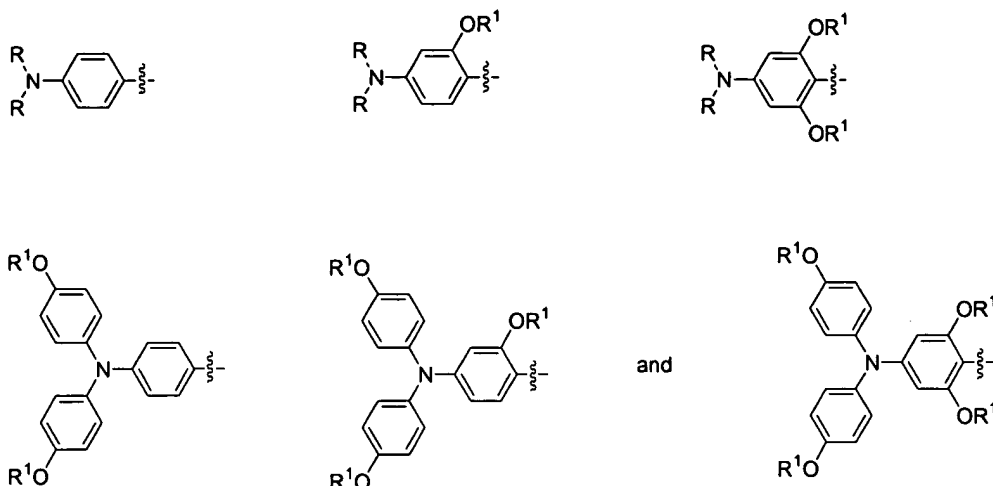
R of D contains 1-12 carbons;

R¹ of D is hydrogen or contains 1-12 carbons;

Y is O or S;

m is 2, 3 or 4; p is 0, 1 or 2; and q is 0 or 1.

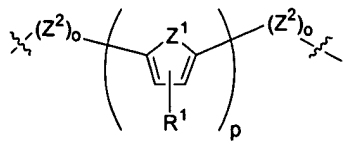
4. The chromophore of claim 2 wherein D is selected from the group consisting of



5. The chromophore of claim 4 wherein, independently at each occurrence, R of D contains 1-12 carbons; R¹ of D is hydrogen or contains 1-12 carbons; and Y is O or S.

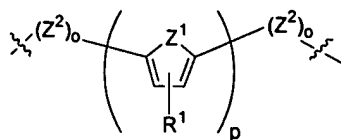
6. The chromophore of claim 1 wherein π^1 and π^2 are both present in the chromophore.

7. The chromophore of claim 1 wherein one or both of π^1 and π^2 is, independently at each occurrence, of the structure

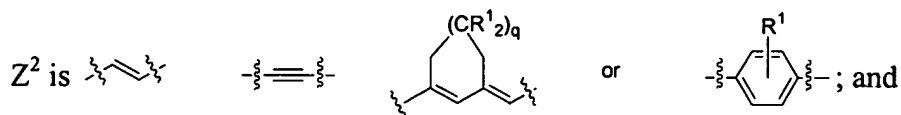


wherein, independently at each occurrence, Z¹ is O, S, Se, NR¹, C(R¹)₂ or -C(R¹)=C(R¹)-; p is 0, 1 or 2;

o is 0,1 or 2;
o + p is at least 1
R¹ of the structure

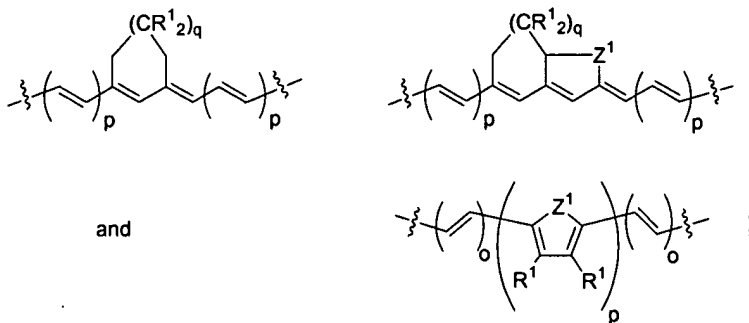


is hydrogen, alkyl, aryl or heteroalkyl;

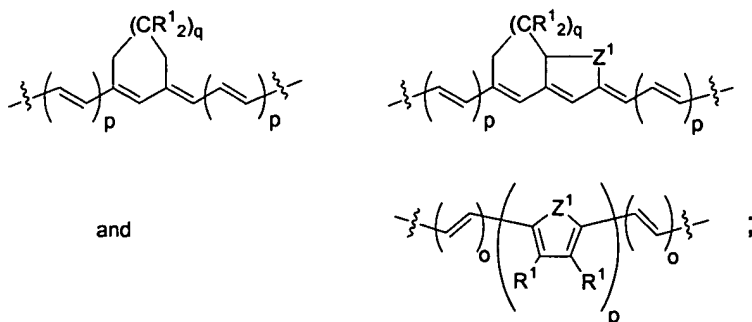


q is 0 or 1.

8. The chromophore of claim 1 wherein, independently, π^1 and π^2 are either absent or selected from the group consisting of



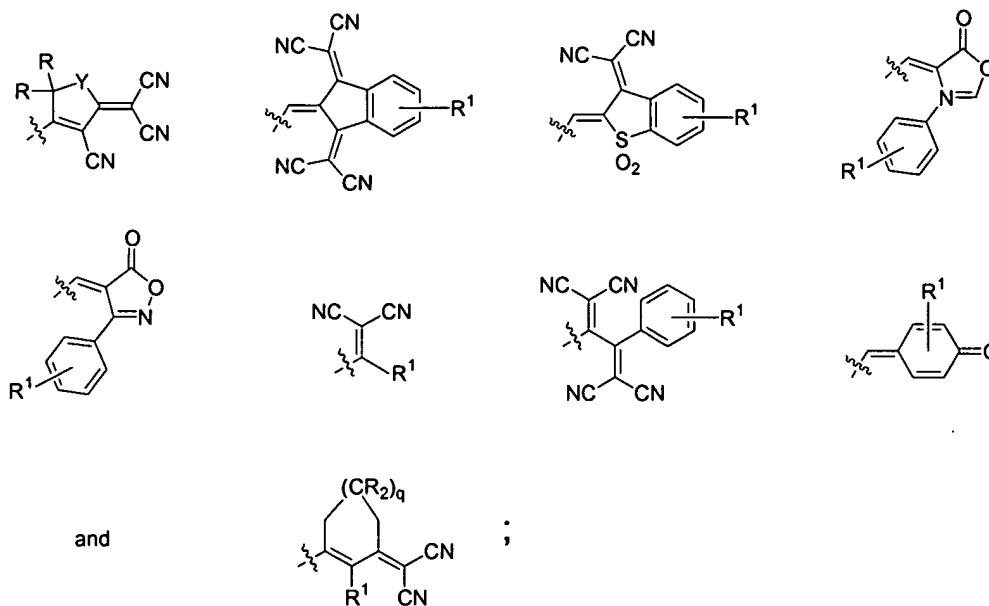
wherein, independently at each occurrence,
R¹ of the structure



is hydrogen, alkyl, aryl or heteroalkyl;
 Z^1 is O, S, Se, NR^1 , $C(R^1)_2$ or $-C(R^1)=C(R^1)-$;
 p is 0, 1 or 2;
 o is 1, 2 or 3;
 $o + p$ is at least 1;
and q is 0 or 1.

9 The chromophore of claim 1 wherein π^1 and π^2 are each $-CH=CH-$.

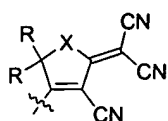
10. The chromophore of claim 1 wherein A is selected from the group consisting of



wherein, independently at each occurrence,
 R of A is alkyl, aryl or heteroalkyl;
 R^1 of A is hydrogen, alkyl, aryl or heteroalkyl;
 Y is O, S or Se; and
 q is 0 or 1.

11. The chromophore of claim 10 wherein, independently at each occurrence,
R of A contains 1-12 carbons;
R¹ of A is hydrogen or contains 1-12 carbons;
Y is O or S; and
q is 0 or 1.

12. The chromophore of claim 1 wherein A is




wherein X is O or S.

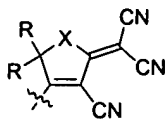
13. The chromophore of claim 1 wherein n = 1-4.

14. The chromophore of claim 1, wherein R¹ is H, alkyl, aryl or heteroalkyl
and X¹ comprises an aromatic ring.

15. The chromophore of claim 1, wherein X¹ is nothing, at R at each
occurrence is a methylene group of an adamantane ring, and R¹ at each
occurrence is a methylene group of an adamantane ring.

16. The chromophore of claim 1, wherein X¹ is nothing, at least one R¹ = -
CH₃, and at least two R = -CH₃

17. The chromophore of claim 1 wherein π^1 and π^2 are ; and A is



wherein R of A is independently at each occurrence alkyl, aryl, or heteroalkyl and X = O or S.

18. The chromophore of claim 1 wherein, independently at each occurrence, R of D or A is $-(CH_2)_wOH$, $-(CH_2)_wOR^1$, $-(CH_2)_wSH$, $-(CH_2)_wCO_2Et$, $-(CH_2)_wCO_2H$, $-(CH_2)_wNH_2$, $-(CH_2)_wCN$, $-(CH_2)_w$ halogen, or $-COC_6H_4OCF=CF_2$ where w is an integer selected from 1-12; and R^1 is hydrogen, R, perfluoroalkyl, SiR_3 , $Si(CH_3)_2$ t-Bu, or $Si(I-Pr)_3$.

19. A composition of matter comprising



wherein E is the chromophore of claim 1; L comprises a chemically reactive group that is crosslinkable; and n = 1-24.

20. The composition of matter of claim 19, wherein L includes a thermally crosslinkable trifluorovinylether group; at least one of D, π , or A of the chromophore is covalently bound to a polymer; and D, π , or A is further substituted with L, halogen, alkyl, aryl, heteroalkyl or heteroaryl.

21. A composition of matter comprising the chromophore of claim 1 non-covalently incorporated into a crosslinkable polymer matrix.

- 1 22. A process comprising sequentially 1) incorporating the chromophore of
2 claim 1 into a polymer matrix; 2) maintaining the polymer matrix at a
3 selected temperature to allow effective chromophore mobility; and 3)
4 applying an electric field sufficient to induce dipole alignment of the
5 chromophore in the polymer matrix.
- 1 23. A process comprising 1) providing the composition of matter of claim 19;
2 2) maintaining the composition at a selected temperature to allow effective
3 chromophore mobility; and 3) applying an electric field sufficient to
4 induce dipole alignment of the chromophores.
- 1 24. The process of claim 23, further comprising the step of heating the
2 composition to a selected temperature to affect crosslinking.
- 1 25. A composition of matter made by the process of claim 22.
- 1 26. A composition of matter made by the process of claim 23.
- 1 27. An electro-optic device comprising the chromophore of claim 1.
- 1 28. An electro-optic device comprising the composition of claim 19.
- 1 29. An interferometric optical modulator or switch, comprising: 1) an input
2 waveguide; 2) an output waveguide; 3) a first leg having a first end and a
3 second end, the first leg being coupled to the input waveguide at the first
4 end and to the output waveguide at the second end; and 4) a second leg
5 having a first end and a second end, the second leg being coupled to the
6 input waveguide at the first end and to the output waveguide at the second

7 end, wherein at least one of the first and second legs includes a
8 composition of matter comprising a chromophore of claim 1.

1 30. An interferometric optical modulator or switch, comprising: 1) an input
2 waveguide; 2) an output waveguide; 3) a first leg having a first end and a
3 second end, the first leg being coupled to the input waveguide at the first
4 end and to the output waveguide at the second end; and 4) a second leg
5 having a first end and a second end, the second leg being coupled to the
6 input waveguide at the first end and to the output waveguide at the second
7 end, wherein at least one of the first and second legs includes a
8 composition of matter of claim 19.

1 31. The modulator or switch of claim 29, wherein the modulator or switch
2 further comprises an electrode positioned to produce an electric field
3 across the first or second waveguide.

1 32. The modulator or switch of claim 30, wherein the modulator or switch
2 further comprises an electrode positioned to produce an electric field
3 across the first or second waveguide.

1 33. An optical router comprising a plurality of switches, wherein each switch
2 comprises: 1) an input; 2) an output; 3) a first waveguide extending
3 between the input and the output; and 4) a second waveguide aligned to
4 the first waveguide and positioned for evanescent coupling to the first
5 waveguide; wherein at least one of the first and second waveguides
6 includes a chromophore of claim 1.

- 1 34. An optical router comprising a plurality of switches, wherein each switch
2 comprises: 1) an input; 2) an output; 3) a first waveguide extending
3 between the input and the output; and 4) a second waveguide aligned to
4 the first waveguide and positioned for evanescent coupling to the first
5 waveguide; wherein at least one of the first and second waveguides
6 comprises a composition of matter of claim 19.